

A Regulatory Guide to Geothermal Direct Use Development

UTAH

Introduction

Geothermal resource temperatures range from low temperatures of 50 to 80 degrees F (10 to 27 °C), to temperatures exceeding 650 degrees F (343°C). Although power can be generated economically from resources as low as 218 degrees F (103° C), power generation projects typically favor resource temperatures above 300 degrees F (149° C). High temperature resources (>300 degrees F, 149° C) can also be used for direct-use applications. However, lower temperature resources (< 212° F, 100° C) are often better suited for these projects.

Low temperature, direct-use projects cover a variety of applications. Projects may include traditional space heating applications, as well as greenhouse heating, spas and swimming pools, aquaculture, crop drying, industrial processing and other activities requiring lower temperatures. Because these projects are primarily water use applications, they often fall under a different regulatory process than high temperature, power generation projects. Typically this process is shaped by water and wastewater laws and regulations, and administered by their respective state, and in some cases, federal water and wastewater resource agencies.

The intent of this document is to help guide developers of direct use geothermal projects through the regulatory process of drilling, using and disposing of low temperature geothermal fluids in the state of Utah. This guide will provide background on the state regulatory process and identify contact information necessary for completing the various applications and permits. This guide; however, cannot substitute for direct communication with the regulatory agencies. These agencies need to be contacted early in the process so that any regulatory hurdles are identified upfront and in time. Projects that are located on federal lands are regulated according to the national Geothermal Steam Act and related federal regulations.

Regulatory Process for Direct Use Applications

In Utah, policies governing geothermal resources are codified in the [Utah Geothermal Resource Conservation Act, Utah Code, Title 73, Chapter 22](#). The State of Utah also enacted Administrative Code Rule 655-1, entitled *Wells Used for the Discovery and Production of Geothermal Energy in the State of Utah*. The rule can be accessed at <http://www.rules.utah.gov/publicat/code/r655/r655-001.htm> and provides a detailed set of rules governing high temperature geothermal resource development. Under this ruling, a “geothermal resource” is defined as “the natural heat energy of the earth, the

energy in whatever form which may be found in any position and at any depth below the surface of the earth, present in, resulting from, or created by, or which may be extracted from natural heat and all minerals in solution or other products obtained from the material medium of any geothermal resource”.

The Utah Geothermal Resource Conservation Act, Section 8, further states that “...geothermal fluids are deemed to be a special kind of underground water resource, related to and potentially affecting other water resources of the state. The utilization or distribution for their thermal content and subsurface injection or disposal of same shall constitute a beneficial use of the water resources of the state”. The Act further defines geothermal fluid as water and steam at temperatures greater than 120°C (248°F).

Both the Geothermal Resource Conservation Act and Rule 655-1 govern how high temperature geothermal resources are regulated in Utah. Although direct use, low temperature geothermal resources are identified in Rule 655-1, they are primarily recognized as a water resource. As a result, the direct use of geothermal water resources, including but not limited to greenhouse heating, warm water aquaculture, space heating, irrigation swimming pools and spas are regulated according to rules governing conventional water well applications. This process involves obtaining the necessary water rights and well construction permits. The major difference from conventional water well development is that direct use projects also need to dispose of the water once it has been used for its design application. Disposal is accomplished through direct injection of the geothermal water via an injection well, or through disposal to either the ground or surface waters if injection is not an option.

The Utah Department of Natural Resources, Division of Water Rights (DWR) is given jurisdiction and authority over all geothermal resources in the State. As part of this authority, the Division requires that all wells for the discovery and production of water to be used for geothermal energy production in the State of Utah, be drilled, operated, maintained, and abandoned in a manner to safeguard life, health, property, the public welfare, and to encourage maximum economic recovery. The Division of Water Rights also administers the issuance of water right permits and well construction. The Utah Division of Water Quality (DWQ) oversees fluid disposal plans and permits.

The regulatory process for developing a direct use geothermal project consists of the following steps:

- Gain access to lands either through lease or direct ownership.
- Contact local and/or county agencies to ensure compliance with local land use laws including building permits and zoning restrictions.
- Secure water right. **(DWR)**
- Obtain well construction permit/develop production well. **(DWR)**
- Determine fluid disposal plan and obtain permits for either underground injection or surface disposal. **(DWQ)**
- Contact the Utah Department of Agriculture and Foods if developing an aquaculture project.

Water Rights

The Division of Water Rights is the state agency that regulates appropriation and distribution of water in the state of Utah. The State Engineer is the chief water rights administrative officer. Water rights are granted through the principal known as the Doctrine of Prior Appropriation. This means that those who first made beneficial use of water should be entitled to continued use in preference to those who came later.

A complete "water code", as amended, is contained in the [Utah Code, Title 73](#). All waters in Utah are public property. A water right is a right to the use of water based upon 1) quantity, 2) source 3) priority date, 4) nature of use, 5) point of diversion and 6) physically putting water to beneficial use.

Water Rights Permit Process

All rights to the use of water in the State of Utah (the exception being water use prior to 1903) must be established through the water appropriation process administered by the Division of Water Rights in accordance with Title 73, Chapter 3. The steps to this process are as follows:

- Apply to appropriate water with the Division of Water Rights (State Engineer).
- Application is advertised for two weeks in an appropriate newspaper, and protests and rebuttals heard.
- State Engineer evaluates application, protests, and other pertinent information and renders a decision on the application based upon principles established in State statute and any competing claims.
- If approved the applicant begins developing water. When fully developed the applicant files proof with the state engineer stating the details of development.
- The State Engineer after reviewing proof issues a Certificate of Appropriation.

Applications to appropriate water for low temperature, direct use geothermal purposes will be processed and investigated by the Division. A water right application form can be downloaded at <http://nrwrt1.nr.state.ut.us/wrinfo/forms/default.asp>. The form requires the applicant to submit information on the amount of water to be withdrawn, the source, the intended use, and other related data. Application fees are on a sliding scale based on the amount of water to be appropriated and range from \$75 to \$500. If the application meets the requirements of [Section 73-3-8](#), it will be approved by the State Engineer and the applicant will be issued a Certificate of Appropriation. Upon receipt of the Certificate, the applicant is required to file proof of appropriation or proof of change of water use with the county recorder in which the water is appropriated within a 30 day period. Failure to do so will void the Certificate of Appropriation. It should be noted that water appropriation issues in specific areas of the state are controlled by office developed policies. These policies are generally developed for a specific [drainage basin](#) and should

be investigated by the applicant to determine if there are any outstanding appropriation issues.

Well Construction

Any well drilled to a depth of greater than 30 feet must be constructed by a currently licensed Utah Water Well Driller as per [Utah Code Section 73-3-25](#). The State Engineer, through the Division of Water Rights, is responsible for licensing requirements and well construction criteria. The State Engineer is also responsible for the promulgation of the Administrative Rules for Water Well Drillers, R 655-4. The Administrative Rules for Water Well Drillers and other pertinent well drilling information is contained in the manual, [State of Utah Water Well Handbook](#). The purpose of these Rules is to assist in the orderly development of underground water, insure minimum well construction standards, prevent pollution of aquifers, and to obtain accurate records of well drilling operations.

Before starting well construction, the developer of a direct use project may want to review data from other wells in the area. Well log data can be obtained from the Division of Water Rights, which maintains a database of well logs. The [well log database](#) contains data reported by well drillers during construction of water wells. Logs from years prior to 1995 are currently being entered by area on a selective basis. All logs after 1995 are entered into the database as they are received. The database currently contains about 20,000 entries. The State of Utah has also assembled a database of [geologic well logs](#) which are available on-line as well. Finally, the Geo-Heat Center, located in Klamath Falls, Oregon also maintains an extensive database covering wells and springs greater than 50° C (122° F) for 16 western states. Information on the database can be found at <http://geoheat.oit.edu/database.htm>. County planning and health departments should also be contacted at this time to check for any additional regulations or ordinances covering well placement and construction.

The process for developing a low temperature, direct use geothermal well mirrors that for a conventional water well. Wells for ground source heat pump applications which are 30 feet or greater in depth and which encounter formations containing groundwater are also regulated by well construction rules. However, permission to drill may be authorized by means other than an application to appropriate, but the well must be so constructed so as to protect aquifers.

Section 73-3-25 of the Utah Code requires every person that constructs a well in the state to obtain a [well driller's license](#) from the state engineer. Any person found to be drilling a well without a valid well driller's license or operator's registration will be ordered to cease drilling by the state engineer. Prior to drilling, a licensed well driller must make certain that a valid authorization or approval to drill exists before beginning drilling or work on a well. A valid authorization to drill can include: 1) an approved application to appropriate, 2) a provisional well approval letter which grants limited authority to drill to determine groundwater characteristics, 3) other specific applications approved by the State Engineer.

Prior to commencing any work (other than abandonment) on any well, the driller must notify the state engineer of their intention by transmitting the information on the "Start Card" to the state engineer by telephone, by FAX, or by e-mail. A specific Start Card is then printed for each well drilling approval and is furnished by the state engineer to the applicant or the well owner. The start card is preprinted with the water right number/provisional/monitor well number, owner name/address, and the approved location of the well. The state engineer marks the approved well drilling activity on the card and the driller is responsible for filling out specific information for that well. Most start cards list the date when the authorization to drill expires. If the expiration date has passed, the start card is no longer valid. If there is no expiration date on the start card, the driller must contact the state engineer's office to determine if the authorization to drill is still valid. When the work is completed, the permission to drill is terminated.

The state engineer or staff of the Division of Water Rights may order that work cease on the construction, repair, or abandonment of a well if a field inspection reveals that the construction does not meet the minimum construction standards to the extent that the public interest might be adversely affected. A cease work order may also be issued if the well driller is not licensed for the drilling method being used for the well construction.

Within 30 days of the completion of work on any well, the driller shall file an official well driller's report (well log) with the state engineer. The blank well log form will be mailed to the licensed well driller upon receipt of the information on the Start Card as described in Subsection R655-4-4(4.2). By law, well driller reports, or well logs, must be submitted to the State Engineer on any well drilled deeper than 30 feet. All data relating to these reports are recorded in the Division of Water Right's well drilling database and are available for viewing over the Internet or in person at the Division's Salt Lake Office.

Well drilling contacts at the state of Utah are presented in Appendix x. The Division of Water Rights also maintains a list of licensed and bonded well drillers, and should be contacted for verification of a well driller's license.

Disposal of Geothermal Fluids

The regulations governing the disposal of low temperature geothermal fluids will depend on the type of application. Non contact geothermal projects, where the geothermal fluids are kept in a closed system and do not come in contact with outside contaminants, will typically have an easier compliance path than projects where contact with potential contaminants is made. When contact is made and water quality is potentially degraded, regulatory requirements may become more stringent to ensure that water quality is maintained.

There are basically three disposal options available to a developer of a direct use geothermal project: underground injection; disposal to surface waters; and/or, disposal to the ground or land application. In some cases, the regulatory agency(s) will specify the preferred disposal method. For example, in critical groundwater areas, reinjection may be required to ensure that the aquifer is maintained. However, in most cases, it will be up to

the project developer to determine the best disposal method based on regulatory requirements and the cost of compliance. The Utah Division of Water Quality is responsible for administering the rules and regulations governing the disposal of geothermal waters for the state of Utah. The main website for the Division of Water Quality can be accessed by clicking [here](#).

Underground Injection Control

The Underground Injection Control (UIC) Program was established in 1982 when Congress passed the Safe Drinking Water Act. This program regulates, to one degree or the other, every "injection" of "fluid" into the subsurface. An "injection" is the emplacement of "fluids" regardless of whether the injection requires the application of pressure or not, and a fluid is defined as any liquid, gas or semisolid which can be made to flow. The intent of the program is to preserve and protect underground water from becoming polluted.

Injection wells are wells that are used as an entry point for some type of fluid (such as geothermal fluid), which is put underground for temporary or permanent disposal or storage. In Utah, the disposal of low-temp geothermal waters, is reviewed on a case-by-case basis. For water right issues, the preferred method is to return the waters to the resource in close proximity to the diversion. If the source is a surface spring, water is returned as close to the spring channel as possible. For an underground source, a reinjection well or sump or pit (depending on the depth of the resource) is the preferred disposal method. If the project is nonconsumptive, measurement into the project and back to the resource could be required.

Underground injection control wells are regulated under [Rule R317-7](#), the Underground Injection Control (UIC) Program. The Utah Division of Water Quality is the lead agency and administers the UIC program. The UIC regulations are designed to ensure contaminants do not escape from wells into aquifers. Wells used to inject fluids associated with the production of oil and natural gas or fluids used for enhanced hydrocarbon recovery are regulated by the Division of Oil, Gas and Mining. All others are regulated by the Division of Water Quality. Most injection wells are authorized by rule and do not need individual permits but must submit notification. The Division of Water Quality sets minimum construction, operating, monitoring, reporting, financial responsibility, closure and recordkeeping requirements for all permitted injection operations.

The owner or operator of any new injection well is required to obtain a permit from the Division of Water Quality prior to construction unless excepted by [R317-7-63](#). The length of time it takes to get an underground injection control permits is 30 to 180 days. Geothermal injection wells fall under this exception as they are considered Class V wells as per the following definitions:

- air conditioning return flow wells used to return to the supply aquifer the water used for heating or cooling in a heat pump;

- injection wells associated with the recovery of geothermal energy for heating, aquaculture and production of electric power.
- Existing and new geothermal Class V injection wells are authorized by rule. What this means is that an applicant does not need to get a permit, however, they still need to notify and get approval from the Division of Water Quality. At that time the Division may set some minimum conditions with the expectation that well is operated in such a manner that groundwater quality is not adversely impacted. The Division of Water Quality may still require any owner or operator of a Class I, III or V well authorized under Section 7-6.3 to apply for and obtain an individual or area permit. Cases where permits may be required include:
 - The injection well is not in compliance with the applicable rules.
 - The injection well is not or no longer is within the category of wells and types of well operations authorized by Section 7-6.3.
 - Protection of an underground source of drinking water (USDW).

Owners or operators of all injection wells regulated by Section 7-6.3 shall submit the following inventory information to the Division of Water Quality:

- facility name and location;
- name and address of legal contact;
- ownership of facility;
- nature and type of injection wells; and
- operating status of injection wells.

Prior to abandoning a Class V well, the owner or operator must notify the Division of Water Quality of their intent to close the well at least 30 days prior to closure. The owner is also required to close the well in a manner that prevents the movement of fluid containing any contaminant into an underground source of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR Part 141 or Utah Public Drinking Water Rules R309-103, or may otherwise adversely affect the health of persons. Finally, the owner must also dispose of or manage any soil, gravel, sludge, liquids, or other materials removed from or adjacent to the well in accordance with all applicable Federal, State, and local regulations and requirements.

Surface Disposal of Geothermal Fluids

The Utah Water Quality Act and Title R317 -Environmental Quality and Water Quality set forth the policies and administrative rules governing water quality in the State of Utah. Discharges to water of the State (surface and groundwater) and industrial discharges to municipal wastewater treatment plants are covered under these laws and regulations. The State Division of Water Quality is the lead agency in administering these regulations.

In general, surface disposal to ground is preferable to discharging into surface waters. Discharging to ground minimizes the chance of degrading existing water quality.

Discharging to ground also keeps the water within the same geographic resource area. A direct use, geothermal project discharging fluids to the ground surface (or wastewater treatment facility) may be required to obtain a state wastewater discharge permit. Discharging waste water to surface waters, including storm drains, also requires a permit prior to beginning operations. Utah Pollutant Discharge Elimination System (UPDES) Permits are required for all industrial, municipal and federal facilities, except those on Indian lands.

Utah Pollution Discharge Elimination System (UPDES)

The goal of the Utah Pollutant Discharge Elimination System (UPDES) program is to control point source discharges of wastewater to ensure that the water quality of the receiving streams is protected. Levels of water quality that are required to maintain the various beneficial uses of the receiving streams are set forth in the Utah Water Quality Act. The Department of Environmental Quality Water Quality Division (WQD) is the lead agency authorized to regulate the discharge of pollutants into state waters. The administrative rules for the UPDES program are presented in Title R317-8 which can be viewed by clicking [here](#).

All point sources of wastewater discharge are required to obtain and comply with UPDES permits. This includes any direct use geothermal project. The effluent limitations and other conditions contained in UPDES permits are based upon preservation of the water quality standard (WQS), with certain categories of wastewaters being required to be treated to a federally-specified minimum level (technology-based treatment) in addition to WQS requirements.

Discharge of low temperature, geothermal fluids to surface waters will require a Utah Pollution Discharge Elimination System (UPDES) permit, even for closed loop systems where the major concern is thermal discharge. The most likely permit forms covering direct use applications are EPA NPDES forms 1 and 2D. [Form 1](#) collects general information from the applicant and must be filled out in addition to a supplemental form. Form 2D covers process wastewater discharge. Although many direct use geothermal applications involve non-contact heat exchange, the DEQ Water Quality Division will most likely still require the applicant to fill out the more detailed [Form 2D](#). This form was designed by the US Environmental Protection Agency to cover projects which discharge process wastewater. There is also a general UPDES permit form for aquaculture facilities-[Concentrated Aquatic Animal Feeding Operations](#).

An NPDES applicant will need to provide mapping information, flow data, an estimate of the type and quantities of pollutants discharged and a brief description of any planned treatment. This information will be used to determine the conditions of the permit including appropriate control or treatment strategies, monitoring and reporting requirements.

Each application submitted by a UPDES new source or UPDES new discharger are to be reviewed within thirty (30) days of its receipt. Application for a UPDES permit submitted

by an existing source will be reviewed for completeness within sixty (60) days of receipt. Upon completing the review, WQD will notify the applicant in writing whether the application is complete. If incomplete, WQD will list the needed information and a deficiency date for submittal.

If an existing source applicant fails to correct deficiencies in the application, the permit may be denied and appropriate enforcement actions may be taken. The effective date of an application is the date on which WQD notifies the applicant that the application is complete. For applications from a new source, or new discharger, WQD will send the applicant a project decision schedule. The schedule will specify target dates by which the Executive Secretary intends to: (a) Prepare a draft permit; (b) Give public notice; (c) Complete the public comment period, including any public hearing; and, (d) Issue a final permit.

Since most direct use applications involve non-contact geothermal heat exchange, the water quality of the source water is unaffected. For these type of projects, permit conditions should be strait-forward. Even so, a developer will likely be required to cool the geothermal water before discharging into a surface water source. Depending on the application, processing of the permit may take from 90 days to 6 months. UPDES permits shall be effective for a fixed term not to exceed 5 years. Fees are based on a per hour rate of \$70.

For some types of projects, such as a fish farm, a developer may have the option to proceed with a general permit versus an individual permit. A general permit covers a set of like facilities, such as a coal facility or a fish farm. Here, a set of conditions are already developed which meet the general operating conditions of these similar facilities. In these cases, a developer would complete Form 1 to see if they qualify under the general permit. If eligible the developer would also need to submit a Notice of Intent form or equivalent, which provides additional information needed by the resources agency administering the NPDES program. The advantage of the general form is that the resource agency can issue the permit as soon as all information needs are satisfied. For individual permits, there is an additional 30 day public notice process, as well as the potential for intervention on the terms and conditions of the permit.

Ground Disposal

The discharge of low temperature, direct use geothermal fluids may require a wastewater discharge permit, particularly if the fluid has been treated or been in contact with any potential source of pollutants. Contact information is included in Appendix A.

Aquaculture Projects

The State of Utah promotes the practice of aquaculture in order to augment food production, expand employment, and promote economic development. As part of this effort, the State passed the Utah Aquaculture Act (Utah Code, Title 4-Chapter 37). The Act identifies the Utah Department of Agriculture and Food (UDAF) as the lead agency

with administrative authority over aquaculture. The rules governing aquaculture facilities are presented in R58-17, [Utah Aquaculture and Aquatic Animal Health Rule](#).

In order to operate an aquaculture facility in the state of Utah, a developer must obtain a Certificate of Registration. The application may require up to 45 days for processing. The forms can be downloaded by clicking [here](#). The cost of the certificate is \$150 per year.

Appendix A

State Contact Information

Water Rights

Jerry D. Olds, State Engineer

Utah Division of Water Rights
1594 W. North Temple Suite 220
P.O. Box 146300
Salt Lake City, UT 84114-6300
(801) 538-7240
Email: jerryolds@utah.gov

This [map](#) shows the boundaries of the regional offices. The Division's regional offices are located as follows:

- **Northern Regional Office (LOGAN)**
Bob Fotheringham, Regional Engineer
1780 North Research Parkway, Suite 104
North Logan, UT 84341
Phone: (435) 752-8755
Email: bobfotheringham@utah.gov
- **Weber River/Western Regional Office (SLC)**
John Mann, Regional Engineer
1594 West North Temple, Suite 220
P.O. Box 146300
SLC, Utah 84114-6300
Phone: (801) 538-7397
Email: johnmann@utah.gov
- **Utah Lake/Jordan River Regional Office (SLC)**
Jim Riley, Regional Engineer
1594 West North Temple, Suite 220
P.O. Box 146300 SLC, Utah 84114-6300
Phone: (801) 538-7400
Email: jimriley@utah.gov
- **Eastern Regional Office (VERNAL)**
Bob Leake, Regional Engineer
State and County Building
152 East 100 North
Vernal, Utah 84078-2126

Phone: (435) 781-5327

Email: bobleake@utah.gov

- **Southeastern Regional Office (PRICE)**

Mark Page, Regional Engineer

453 South Carbon Avenue

P.O. Box 718

Price, Utah 84501-0718

Phone: (435) 637-1303

Email: markpage@utah.gov

- **Sevier River/Southern Regional Office (RICHFIELD)**

Kirk Forbush, Regional Engineer

130 North Main Street

P.O. Box 563

Richfield, Utah 84701-0563

Phone: (435) 896-4429

Email: kirkforbush@utah.gov

- **Southwestern Regional Office (CEDAR CITY)**

Kerry Carpenter, Regional Engineer

585 North Main Street

P.O. Box 506

Cedar City, Utah 84721-0506

Phone: (435) 586-4231

Email: kerrycarpenter@utah.gov

Well Drilling Contacts

Lee Sim Assistant State Engineer (801) 538-7380

Jim Goddard Well Drilling Specialist (801) 538-7314

Debbie Reese Water Rights Tech II (801) 538-7416

leesim@utah.gov

jimgoddard@utah.gov

debbiereese@utah.gov

Geothermal Fluid Disposal

General Contact

Division of Water Quality

288 North 1460 West (Cannon building) 3rd floor

Box 144870

Salt Lake City, Utah 84114-4870

Telephone: 801/538-6146 FAX: 538-6016

Website: <http://waterquality.utah.gov/>

Underground Injection Control Program and Surface Disposal to Ground

Division of Water Quality
Groundwater Protection Section
288 North 1460 West (Cannon building) 3rd floor
Box 144870
Salt Lake City, Utah 84114-4870
Dennis Fredrick, Manager
Phone: 801/538-6038
E-mail: dfrederi@utah.gov

National Pollution Discharge Elimination System (NPDES)

Division of Water Quality
Permitting and Compliance Section
288 North 1460 West (Cannon building) 3rd floor
Box 144870
Salt Lake City, Utah 84114-4870
Gayle Smith, Manager
Phone: 801/538-6779
E-mail: gsmith@utah.gov

Aquaculture Permit

Utah Division of Wildlife Resources,
Wildlife Registration Office
1594 West North Temple, Salt Lake City, Utah 84114

Appendix B

Geothermal References and Contacts

References

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Contacts

Geo-Heat Center

Website: <http://geoheat.oit.edu/>

Geothermal Education Office

Website: www.geothermal.marin.org

Geothermal Resources Council

Website: www.geothermal.org

Geothermal Heat Pump Consortium

Website: www.geoexchange.org

International Ground-Source Heat Pump Association

Website: www.igshpa.okstate.edu

U.S. Department of Energy

Website: www.eren.doe.gov/geothermal

Washington State University Extension Energy Program

Website: <http://www.energy.wsu.edu/projects/renewables/geothermal.cfm>